

CLAIMS

Sub 7
1 ~~1. A method of making aluminum oxynitride, the method comprising:~~
2 ~~introducing aluminum oxide particles into a chamber;~~
3 ~~dispersing the particles within the chamber; and~~
4 ~~forming the aluminum oxynitride comprising passing nitrogen gas over the dispersed~~
5 ~~particles.~~

1 2. The method of claim 1, wherein forming the aluminum oxynitride comprises
2 heating the particles.

Sub 12
1 ~~3. The method of claim 1, further comprising introducing carbon into the chamber to~~
2 ~~form a mixture comprising aluminum oxide and carbon.~~

1 4. The method of claim 1, further comprising introducing a reducing agent into the
2 chamber to form a mixture comprising aluminum oxide and the reducing agent.

1 5. The method of claim 1 wherein forming the aluminum oxynitride comprises
2 heating the mixture.

Sub 13
1 ~~6. A method of making aluminum oxynitride, the method comprising:~~
2 ~~introducing a mixture comprising aluminum oxide and carbon into a chamber;~~
3 ~~agitating the mixture within the chamber; and~~
4 ~~heating the mixture to make aluminum oxynitride.~~

1 7. The method of claim 6, further comprising:
2 introducing nitrogen gas into the chamber.

1 8. The method of claim 6, wherein agitating the mixture comprises rotating the
2 chamber.

Sub 14
1 ~~9. The method of claim 6, further comprising:~~
2 ~~cooling the aluminum oxynitride;~~

3 ~~removing the aluminum oxynitride from the chamber; and~~
4 ~~introducing a second mixture comprising aluminum oxide and carbon into the~~
5 ~~chamber.~~

1 10. The method of claim 6, further comprising:
2 forming the aluminum oxynitride into a transparent structure.

1 11. The method of claim 10, wherein forming the aluminum oxynitride comprises:
2 forming a green body comprising the aluminum oxynitride; and
3 sintering the green body.

1 12. The method of claim 11, further comprising:
2 isostatically pressing the sintered green body under heat.

1 13. The method of claim 6, wherein the aluminum oxynitride comprises $\text{Al}_{23-1/3x}\text{O}_{27+x}\text{N}_{5-x}$, where $0.429 \leq x \leq 2$.

1 ~~14. A method of making aluminum oxynitride, the method comprising:~~
2 ~~introducing a first reaction mixture comprising aluminum oxide and carbon into a~~
3 ~~chamber;~~
4 ~~agitating the first reaction mixture within the chamber;~~
5 ~~heating the chamber to a temperature to form aluminum oxynitride from the first~~
6 ~~reaction mixture;~~
7 ~~removing the aluminum oxynitride while maintaining the temperature of the chamber;~~
8 ~~and~~
9 ~~introducing a second reaction mixture comprising aluminum oxide and carbon into~~
10 ~~the chamber while maintaining the temperature of the chamber.~~

1 15. The method of claim 14, further comprising:
2 introducing nitrogen gas into the chamber.

1 16. The method of claim 14, wherein introducing the first reaction mixture comprises
2 introducing the first reaction mixture from a hopper.

1 17. The method of claim 14, wherein agitating the first reaction mixture comprises
2 rotating the chamber.

1 18. The method of claim 14, wherein the chamber comprises an exit opening and
2 removing the aluminum oxynitride comprises retracting a plunger within the chamber,
3 thereby allowing the aluminum oxynitride to flow through the exit opening.

1 19. The method of claim 14, further comprising:
2 forming the aluminum oxynitride into a transparent structure.

1 20. The method of claim 19, wherein forming the aluminum oxynitride comprises:
2 forming a green body comprising the aluminum oxynitride; and
3 sintering the green body.

1 21. The method of claim 20, wherein forming the aluminum oxynitride comprises:
2 isostatically pressing the sintered green body under heat.

1 22. The method of claim 14, wherein the aluminum oxynitride comprises Al_{23} .
2 $1/3xO_{27+x}N_{5-x}$, where $0.429 \leq x \leq 2$.

1 23. An aluminum oxynitride made according to the method of claim 6.

1 24. The aluminum oxynitride of claim 23, wherein the aluminum oxynitride
2 comprises $Al_{23-1/3x}O_{27+x}N_{5-x}$, where $0.429 \leq x \leq 2$.

3 ~~25. A method of making aluminum oxynitride, the method comprising:~~
4 heating a chamber;
5 continuously introducing a reaction mixture comprising aluminum oxide and carbon
6 into the chamber;
7 agitating the reaction mixture within the chamber; and